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**Research Article**

# Comparative clinical study on the efficacy of Psidium guajava bark and Terminalia arjuna bark in the management of Hypertension

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## Abstract

Hypertension (HTN) is one of the disease of global concern in the present day. It is one of the leading causes of Heart diseases and strokes. Hence it is important to maintain the normal blood pressure of around 120/80 mm of Hg. Many medicines have been included in the group of anti-hypertensive drugs like calcium channel blocker, beta blockers etc which are effective in the management of hypertension. Many herbal drugs are also being used for the management of Hypertension like *Sarpagandha, Asvagandha, Arjuna* etc in Ayurvedic medicine since a long time. Inspite of their use, the use is limited to mild to moderate cases of Hypertension. Hence a quest for a new plant based drug, having anti-hypertensive properties is searched. *Psidium guajava*, which is used for its fruits is found to have similar properties to drugs like *Arjuna* is selected for the study, for comparing clinically the efficacy of the stem bark of both the plant in the management of HTN. 40 uncomplicated HTN patients were selected for the study based on the inclusion and exclusion criteria and were administered with the stem bark of PG for group A and stem bark of TA for group B. Observations and results have shown that both the drugs are equally effective in reducing the parameters of the study like headache, palpitations, insomnia, systolic HTN, Diastolic HTN and Anxiety. From the overall effect of the study, it has been observed that PG have shown a slight better overall improvement in the maintenance of the HTN than Arjuna. Even though the efficacy is not significantly different for both the groups. Thus from the study it can be concluded that as both the medicines have shown equal efficacy in reducing HTN, they can be used as substitute drugs to each other in the management of HTN. No adverse events were noted during the study in both the groups, indicating that the drugs are safe to use and do not cause any harmful effects.

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**Keywords:** Anti-Hypertension, *Arjuna, Parevata, Ayurveda, Rakta gata vata, Medya*

## Introduction

In today's specialized medical world, Ayurveda stands out with its holistic approach, considering the body as a unified entity. Understanding the body as a whole is challenging when its components exist interdependently with reciprocal interactions. Ayurveda recognized the multidimensional nature of the body, mind and soul long before it gained recognition in modern medicine. Technological advancements have made life easier, but in the pursuit of money and development, people have neglected their primary goals of *Dharma, Artha, Kama, and Moksha*, leading to the development of various diseases, including Hypertension.

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Based on the aetiology, High Blood Pressure is classified as either Primary/Essential or Secondary Hypertension. Primary or "Essential Hypertension" has no known cause, however many of the lifestyle factors contribute to this condition. About 90–95% of cases of Hypertension are categorized as Primary Hypertension with no obvious underlying cause. Secondary Hypertension is caused by some other medical conditions/problems or the use of certain medications. The causes of secondary Hypertension include Kidney diseases like Reno-vascular disease and Chronic renal disease etc., are the most common secondary cause of Hypertension, Endocrine disorders, Pregnancy, use of contraceptive pills etc., A number of pharmaceutical agents, well evidenced by large randomized clinical trials, are available for initial treatment of Hypertension. These include older molecules such as thiazide diuretics and beta- blocking agents, and newer molecules such as Dihydropyridine calcium channel blockers (CCB), Angiotensin converting enzyme (ACE) inhibitors, and Angiotensin receptor blockers (ARB).

Essential hypertension remains a major modifiable risk factor for cardiovascular disease (CVD) despite important advances in our understanding of its pathophysiology and the availability of effective treatment strategies. High blood pressure (BP) increases the risk of CVD for millions of people worldwide, and there is evidence that the problem is only getting worse. In the past decade, age-adjusted rates of stroke incidence have risen, and the slope of the age-adjusted rate of decline in coronary disease has levelled off. The incidence of end-stage renal disease and the prevalence of heart failure have also increased. A major contributor to these trends is inadequate control of Blood Pressure in the Hypertensive population.

Living sedentary lives with little exercise and more time spent in front of a screen has become the norm. This inactivity raises the risk of Hypertension by promoting weight gain and lowering Cardiovascular fitness. Our diets have changed due to the prevalence of processed foods, which are frequently heavy in added sugars, harmful fats, and sodium. Over time, these dietary decisions may cause blood pressure to rise. In today's fast-paced environment, chronic stress is a common problem that can lead to Hypertension. Because stress causes the body to produce more cortisol, blood pressure can rise as a result. In addition, it is well known that consuming large amounts of alcohol and tobacco products increases the risk of Hypertension. Environmental elements like exposure to specific chemicals and air pollution may also play a role in the increasing prevalence of Hypertension. These factors can contribute to Inflammation and oxidative stress, which can damage blood vessels and elevate Blood Pressure (1).

While there is no direct mention of Hypertension in Ayurvedic texts, they emphasize the need for physicians to identify the nature of an unknown ailment by examining the Dosha, site of manifestation, and etiological factors before initiating treatment. Various terms have been identified in Ayurveda that describe Hypertension, highlighting different perspectives, but the consensus is that the major pathophysiology involves Rakta (blood) and the blood vessels. Various Ayurvedic scholars have equated the disease Hypertension with different names as, *Raktagata Vata, Siragata Vata, Avrita Vata, Dhamani Paripurana, Rakta Viksepa, Vyana prakopa, Raktamada, Uccaraktacapa, Vyana Atibala* etc.

*Agni dusti* results in the formation of *Ama* (toxins), which subsequently leads to *Dhatu Dusti in Rasa and Rakta*. The production of *Ama* causes *Strotorodha* and partially blocks the normal circulation of *Rasa and Rakta*, further aggravating *Vyana Vayu. Prakupita Avalambaka kapha* (aggravated *Avalambaka Kapha*) causes increased contractility of the heart, while exacerbated *Vyana Vayu* leads to enhanced blood ejection force (*Gati*) from *Hrudaya*. These factors result in the forceful ejection of blood from the arteries, leading to increased resistance and High Blood pressure.

*Hypertension* is being managed with herbal drugs like *Arjuna, Sarpagandha, Jatamansi* etc, which are taken as standard drugs and are proved through various researches. Drugs like *Arjuna* act on the blood vessels and cause vasodilation and also decreases the heart rate in dose dependent manner and help in reducing the Hypertension (2).

Drugs like *Jatamansi* (3) and *Tagara* (4) act as *medya drugs* and has got sedative action thereby reduce the stress and Hypertension. *Psidium guajava* L. (PG) is one of the herbal drug belonging to family Myrtaceae, It is considered in Ayurveda texts in the name of *Parevata*. It closely resembles to *Arjuna*, *Terminalia arjuna (Roxb.) Wight & Arn.*(TA), in both morphologically and also pharmacologically it is widely used for its fruits, which are good source of calcium. The leaves of it are also useful for various medicinal purposes in Ethano-medicine.

Little has been observed regarding the use of bark of in the medicinal research. Hence, this study has been taken up to compare the efficacy of the bark of *PG* and bark of *TA* in the management of Hypertension.

## Materials and Methods

**Selection and Preparation of the medicine**

*Parevata* bark (*Psidium guajava* L.) and *Arjuna* bark (*Terminalia arjuna* Roxb.) are collected from the local forests of Tirupati and are authenticated in the Department of Dravyaguna, SV Ayurvedic College, Tirupati. Voucher specimens are deposited in the Dravyaguna departmental museum of SV Ayurvedic College for further reference.

**Preparation of the drug**

**Collection of the plant materials**

The stem bark of *Psidium guajava* L. were identified by their gross morphological characters and collected from Besthavaripeta, Tirupati, Mamillapalli and the stem bark of *Terminalia arjuna* Roxb. were collected based on their morphological characters from surroundings of S.V. Ayurvedic college, SVIMS campus. They are collected based on the good collection practices and are authenticated in the Department of Dravyaguna, SV Ayurvedic College, Tirupati. Voucher specimens were deposited in the Dravyaguna departmental museum of SV Ayurvedic College for further reference.

The physical impurities like mud, sand and other impurities are removed. They were dried in room temperature, cut into small pieces and stored in a neat and clean airtight container separately and are preserved in a moisture free area and used for further processes.

***Churna* preparation**

Later, they were dried under shade for 15 days. Later dried stem bark of both the drugs were pulverized individually. The obtained powder was sieved with mesh no. 100 to obtain fine powder. The powder is filled in a 500mg capsule using the capsule filling machine for dispensing to the patients. The procedure was carried out at Sri Srinivasa Ayurvedic Pharmacy, Srinivasa mangapuram.

**Dose** : 2 capsules (500mg each) TID (total 3 gm per day).

**Anupana** : Luke warm water.

**Duration** : 1 month with follow up, once in 15 days.

**Clinical study design and setting**

A randomized controlled single blind comparative clinical study was conducted on 40 patients suffering from Hypertension. They were selected from the Outpatient Department (OPD) of P.G. Department of Dravyaguṇa, In Patient Department (IPD) of S.V. Ayurvedic Hospital, Tirupati and are divided into two groups each comprising 20 patients.

Group – A: Treated with PG Capsule 2 TID After food.

Group – B: Treated with TA Capsule - 2 TID After food.

**Inclusive criteria**

Patients with age group of 30 - 60 years suffering from uncomplicated Primary Hypertension with systolic blood pressure greater than 130 mmHg and less than 200 mmHg and Diastolic Blood pressure greater than 85 mmHg and less than 120 mmHg were included in the study.

**Exclusion criteria**

Patients with age group less than 30 years and above 60 years suffering from systolic blood pressure less than 130 mmHg and greater than 200 mmHg, Diastolic Blood pressure less than 85 mmHg and greater than 120 mmHg and suffering Chronic Hypertension and Metabolic disorders are excluded from the study.

**The study protocol**

All subjects underwent History, taking Clinical Examination and Laboratory investigations which included screening for Hypertension as per proforma.

**Pre treatment evaluation**

All subjects underwent thorough scrutiny upon registration, which included assessment of their age, gender, marital status, socioeconomic status (whether rural or urban, religion, education level, occupation, and monthly income), appetite, use of digestive powder, any addictions, bowel habits, dietary habits, and lifestyle.

Following the preliminary registration, a detailed case history of each patient was obtained, and a physical examination was conducted according to the research case proforma.

**Subjective parameters and assessment criteria:**

1. Headache (Numeric rating scale):
2. Palpitations.(present or absent as mentioned by the patient)
3. Sleeplessness. (Insomnia severity index)
4. Sweating. (presence or absence as mentioned by the patient)

**Objective parameters**

1. Hamilton Anxiety Rating Scale.
2. Measurement of Hypertension as per Davidson's Principles and Practice of medicine.
3. Rate, Rhythm, Amplitude of Pulse will be taken as per Standards.

**Assessment criteria for subjective parameters**

**Numeric rating scale (5)**

The Numeric Rating Scale (NRS-11) is an 11-point scale for patient self-reporting of pain. It is based solely on the ability to perform activities of daily living (ADLs) and can be used for adults and children 10 years old or older.

**Table 1: Numeric rating scale**

| Rating | Pain level |
|---|---|
| 0 | No Pain |
| 1-3 | Mild Pain (nagging, annoying, interfering little with ADLs) |
| 4-6 | Moderate Pain (interferes significantly with ADLs) |
| 7-10 | Severe Pain (disabling; unable to perform ADLs) |

**Palpitations**

Palpitations are not always the result of a physical problem with the heart and can be linked to anxiety. However, they may signal a fast or irregular Heart beat Palpitations can be brief or long-lasting. They can be intermittent or continuous. Other symptoms can include dizziness, shortness of breath, sweating, headaches, and chest pain.

**Palpitations and Sweating**

**Table 2: Grading of palpitations and Sweating**

| Grade | Palpitations | Sweating |
|---|---|---|
| 0 | Absent | Absent |
| 1 | Present | Present |

**Insomnia severity index (ISI) (6)**

Insomnia severity Index measures severity of the insomnia. It is divided into seven questions regarding the Difficulty falling asleep, staying asleep, waking up too early, satisfaction of the sleep, interference with the routine daily activities, noticeable difference and distress. The seven questions will be measured 0-5 scores 0 being not at all to 4 very much.

Scores of all the seven questions are added to get the final score, ranging from 0-28

Assessment of the Insomnia severity will be based on the following.

- 0-7 = No clinically significant insomnia
- 8-14 = Sub-threshold insomnia
- 15-21 = Clinical insomnia (moderate severity)
- 22-28 = Clinical insomnia severe)

**Hamilton Anxiety Rating Scale (HAM-A) (7)**

It is a 14 item clinical based anxiety scale. It consists of 14 items related to anxious mood, tension, fears, insomnia, cognitive changes, depressed mood, muscular and sensory somatic symptoms, cardiovascular, respiratory, gastrointestinal, genitourinary, and autonomic symptoms. Each item will be measured 0-5 scores 0 being not present to 4 very severe.

Assessment of the anxiety will be based on the following

Each item is scored on a scale of 0 (not present) to 4 (severe), with a total score range of 0-56, where

- <17 indicates mild severity,
- 18-24 mild to moderate severity
- 25-30 moderate to severe;
- 31-56 severe to very severe anxiety.

**Table 2: Measurement of Hypertension (8)**

| S.No | Category | Systolic BP (mmHg) | Diastolic BP (mmHg) |
|---|---|---|---|
| **1** | **Blood pressure** | | |
| | Optimal | <120 | <80 |
| | Normal | <130 | 85 |
| | High normal | 130-139 | 85-89 |
| 2 | **Hypertension** | | |
| | Grade1(mild) | 140-159 | 90-99 |
| | Grade 2 (moderate) | 160-179 | 100-109 |
| | Grade 3 (severe) | ≥180 | ≥110 |
| 3 | **Isolated Systolic Hypertension** | | |
| | Grade 1 | 140-159 | <90 |
| | Grade 2 | ≥160 | <90 |

**Rate (9)**

The rate of the pulse can be observed and measured on the outside of an artery by tactile or visual means. It is recorded as arterial beats per minute or BPM. Although the pulse and heart beat are related, they are not the same. For example, there is a delay between the onset of the heart beat and the onset of the pulse, known as the pulse transit time, which varies by site. Similarly measurements of heart rate variability and pulse rate variability differ

**Rhythm (9)**

A normal pulse is regular in rhythm and force. An irregular pulse may be due to sinus arrhythmia, ectopic beats, atrial fibrillation, paroxysmal atrial tachycardia, atrial flutter, partial heart block etc. Intermittent dropping out of beats at pulse is called "intermittent pulse". Examples of regular intermittent (regularly irregular) pulse include pulsus bigeminus, second-degree atrioventricular block. An example of irregular intermittent (irregularly irregular) pulse is atrial fibrillation.

**Amplitude (9)**

A bounding pulse signifies high pulse pressure. It may be due to low peripheral resistance (as seen in fever, anemia, thyrotoxicosis, hyperkinetic heart syndrome [de], A-V fistula, Paget's disease, beriberi, liver cirrhosis), increased cardiac output, increased stroke volume (as seen in anxiety, exercise, complete heart block, aortic regurgitation), decreased distensibility of arterial system (as seen in atherosclerosis, hypertension and coarctation of aorta)

**Statistical analysis of the results**

Assessment was done on the basis of decreased in the clinical symptoms of Headache, Insomnia, Anxiety, Palpitations, Sweating, Systolic Blood pressure, Diastolic Blood pressure and the Observations were recorded in a master chart prepared in Microsoft Excel 2019.

Statistical analysis was carried out using **"Analysis tool pack Add-in of Microsoft Excel-2019"** and **"Graph pad Prisma Version -7"** by applying paired't'- Test.

The obtained information was analyzed statistically in terms of mean score(x), Standard Deviation (S.D.), Standard Error (S.E.). Paired t-Test was carried out and probability (p value) is assessed at the level of 0.05, 0.01, and 0.001. The P values were interpreted as

- Insignificant : $p > 0.05$
- Significant : $p < 0.05$
- Highly significant : $p < 0.01$, $p < 0.001$
- Extremely significant : $p < 0.0001$

**Criteria of overall assessment**

The overall effect of the therapy is assessed by the percentage of the relief obtained in Hypertension criteria in each patient

- Good improvement: Normal values of hypertension or change of 3 grades of Hypertension
- Moderate improvement: change of 2 grades in Hypertension
- Mild improvement: change of 1 grade in Hypertension
- No improvement: No change in Hypertension grade

Observations were recorded in a master chart prepared in Microsoft Excel 2019.

## Observations and Results

**Observations**

**Table 4: Showing Distribution of the patients according to demographic data**

| Demographic detail | | Number of Patients | | | Percentage (%) |
|---|---|---|---|---|---|
| | | Group-A | Group-B | Total | |
| Age Group | 41-50 | 7 | 9 | 16 | 40% |
| | 51-60 | 8 | 5 | 13 | 32.5% |
| | 61-70 | 5 | 6 | 11 | 27.5% |
| Gender | Male | 9 | 13 | 22 | 55% |
| | Female | 11 | 7 | 18 | 45% |
| Habit | Urban | 6 | 8 | 14 | 35% |
| | Rural | 14 | 12 | 26 | 65% |
| Socio-economic status | Lower Class | 8 | 10 | 18 | 45% |
| | Middle Class | 9 | 8 | 17 | 42.5% |
| | Upper Class | 3 | 2 | 5 | 12.5% |
| Nature of the work | House wife | 9 | 8 | 17 | 42.5% |
| | Sedentary (Desk Job) | 1 | 1 | 2 | 5% |
| | Farmer | 5 | 5 | 10 | 25% |
| | Engineer | 1 | 0 | 1 | 2.5% |
| | Business | 4 | 5 | 9 | 22.5% |
| | Teacher | 0 | 1 | 1 | 2.5% |
| Dietary habits | Vegetarian | 2 | 6 | 8 | 20% |
| | Mixed | 18 | 14 | 32 | 80% |
| Nidra Type | Normal | 7 | 5 | 12 | 30% |
| | Disturbed | 13 | 15 | 28 | 70% |
| Prakruti | Vata-Pitta | 14 | 13 | 27 | 67.5% |
| | Pitta-Kapha | 3 | 5 | 8 | 20.0% |
| | Vata-Kapha | 3 | 2 | 5 | 12.5% |

It is evident from the table that maximum number of patients i.e. 16 (40%) were between 41-50 years age group, followed by 13 patients (32.5%) between 51-60 years age group, 11 patients (27.5%) between 61-70 years age group.

In this study, maximum number of patients i.e. 22 (55%) were male and 18 patients (45%) were female; 26 (65%) were from rural areas while 14 patients (35%) were from urban area.

Across both groups, there are a total of 18 patients belonging to the lower socio-economic class, representing 45% of the total patient population. 17 patients belonging to middle class (42.5%) and 5 patients (12.5%) belonging to the upper class.

Among the nature of the work, 17 (42.5%) patients were house wives, farmers were 10 (25%) and remaining were doing desk job (5%), business (22.5%) , teachers and Engineers were 2.5% each.

Most of the patients i.e., 32 (80%) were non-vegetarians and 8 (20%) were vegetarians. 70% (28 patients) were suffering from insomnia. And most of the patients enrolled were vata pitta prakruti 27 (67.5%), followed by pitta kappa 8 (20%) and vata kappa 5 (12.5%).

## Results

**Table 5: Showing the statistical data of the parameters**

| Parameters | Group | Mean | | % | SD | | SED | T value | P value | Significance |
|---|---|---|---|---|---|---|---|---|---|---|
| | | BT | AT | | BT | AT | | | | |
| Headache | Group A | 2.50 | 1.10 | 56 | 2.24 | 1.07 | 0.320 | 4.3813 | = 0.0003 | Extremely statistically significant. |
| | Group B | 2.50 | 1.10 | 56 | 2.24 | 1.07 | 0.320 | 4.3813 | = 0.0003 | Extremely statistically significant. |
| Palpitations | Group A | 13.75 | 11.20 | 18.54 | 4.14 | 2.48 | 0.555 | 4.5965 | 0.0002 | Extremely statistically significant. |
| | Group B | 13.65 | 12.20 | 10.62 | 4.38 | 3.72 | 0.266 | 5.4448 | <0.0001 | Extremely statistically significant |
| Insomnia (ISI Scale) | Group A | 13.75 | 11.20 | 18.54 | 4.14 | 2.48 | 0.555 | 4.5965 | 0.0002 | Extremely statistically significant. |
| | Group B | 13.65 | 12.20 | 10.62 | 4.38 | 3.72 | 0.266 | 5.4448 | <0.0001 | Extremely statistically significant |
| Sweating | Group A | 19.80 | 17.70 | 10.606 | 3.07 | 2.05 | 0.369 | 5.6878 | <0.0001 | Extremely statistically significant. |
| | Group B | 19.10 | 17.75 | 7.068 | 2.53 | 2.12 | 0.244 | 5.54188 | <0.0001 | Extremely statistically significant |
| Systolic Blood Pressure | Group A | 159.00 | 137.0 | 13.836 | 12.52 | 9.79 | 2.675 | 8.2230 | <0.0001 | Extremely statistically significant |
| | Group B | 153.00 | 139.0 | 9.15 | 11.74 | 8.26 | 2.087 | 6.4688 | <0.0001 | Extremely statistically significant |
| Diastolic Blood Pressure | Group A | 89.00 | 80.50 | 9.55 | 5.53 | 3.94 | 1.313 | 6.4743 | <0.0001 | Extremely statistically significant |
| | Group B | 88.00 | 84.50 | 3.97 | 6.16 | 5.10 | 1.094 | 3.1986 | = 0.0047 | Very statistically significant |
| Anxiety (HAM Scale) | Group A | 19.80 | 17.70 | 10.606 | 3.07 | 2.05 | 0.369 | 5.6878 | <0.0001 | Extremely statistically significant |
| | Group B | 19.10 | 17.75 | 7.068 | 2.53 | 2.12 | 0.244 | 5.54188 | <0.0001 | Extremely statistically significant |

From the above table it is evident that both the drugs PG and TA have shown extremely significant results in all the parameters, indicating that both the drugs can be used for the management of the Hypertension.

**Table 6: Showing the overall improvement in both the group**

| Grade | Group A (PG) | | Group B (TA) | |
|---|---|---|---|---|
| | No. of Patients | Percentage (%) | No. of Patients | Percentage (%) |
| No Change | 7 | 35 | 9 | 45 |
| Mild | 11 | 55 | 11 | 55 |
| Moderate | 12 | 10 | 0 | 0 |
| Good | 0 | 0 | 0 | 0 |

Even though both the drugs have shown significant improvement, overall improvement shows that, *Psidium guajava* (PG) much better improvement than *Terminalia arjuna* (TA) in this experiment. TA showed mild change in hypertension in 55% of the patients and no change in 45% of the patients, whereas PG has shown 10 % of the patients shoed moderate improvement 10%, moderate 55% and only 35% showing no improvement. None of the patients have got good or drastic change in the hypertension. No adverse events were observed or reported by the patients during the study.

## Discussion

The present study was undertaken to compare the efficacy of PG and TA in the management of Hypertension.

Hypertension is a condition where blood pressure increases and produces the symptoms like Palpitations, Sleeplessness, Headache etc. These symptoms are usually seen when there is a vitiation of *Vata, Pitta, Raktadosas* as per the Ayurvedic literature.

To treat the condition Ayurveda suggests the use of drugs which are having the properties of *Hrudya* and which can reduce the vitiation of *Vata, Pitta, Raktadosas*.

*Parevata* is one such drug which is mentioned in *Raja nighantu* having *Hrudya karma* and also is useful to normalize the Vata, *Pitta, Raktadosas* by virtue of its *Madhura vipaka* and *guru guna*.

*Parevata* is equated to *Psidium guajava* L. as per the literature (10). Present scientific researchers also proved that various parts of *Psidium guajava* L. are being used as a Cardio-protective agents.

Stem bark of *Psidium guajava* L. contains Leucocyanidin which acts as Cardio-protective. Luteic acids, Ellagic acid, Tannins, Sterols, Glycoside Amritoside, Crystals of Calcium oxalates and Nitric oxide radicals have antioxidant property which reduces oxidative stress and thus decreases the generation of Reactive Oxygen Species (ROS) which has a key role in pathophysiology of Hypertension and also improve endothelial and vascular function which decreases the severity of blood pressure. Ellagic acid also has Anti-proliferative property which could reduce the Cardio-vascular damage (11).

Stem bark of Terminalia arjuna is being used as one of the important drug for the management of Hypertension since a long time by many physicians across the globe and has been studied much for its anti-hypertensive and cardio protective properties. (12)

The results of the present comparative study showed no difference between the efficacy of both the drugs in the management of hypertension.

**Subjective Parameters**

**Anxiety:** Group A experienced a 10.60% relief in Anxiety, resulting in an Extremely Statistically Significant change (p <0.0001) and a 7.06 % relief in Anxiety was observed in Group B, and the change was Extremely Statistically Significant (p <0.0001)

**Headache:** Group A experienced a 56 % relief in Headache, resulting in an Extremely Statistically Significant change (p <0.0001) and a 44.89 % relief in Headache was observed in Group B, and the change was Extremely Statistically Significant (p <0.0001)

**Palpitations:** Group A out of 6 patients 4 patients got relief resulting in 66.66 %. In Group B out of 7 patients 4 patients got relief resulting in 57.14 %

**Sleeplessness:** Group A experienced a 18.654% Reduction in Sleeplessness, resulting in an Extremely Statistically Significant change ($p = 0.0002$). A 10.62% Reduction in Sleeplessness was observed in Group B, and the change was Extremely Statistically Significant ($p < 0.0001$)

**Sweating**: Group A out of 3 patients 2 patients got relief resulting in 66.6

**Objective parameters**

**Rate:** There is mild increase in the rise of pulse rate but almost all the patients has normal pulse rate as per standards.

**Rhythm**: Rhythm is normal for all the patients, but only one patient have no change in Group A

Amplitude: Normal as per standards

**Probable mode of action**

Hypertension being a *Vata Pitta pradana vyadhi* needs medicine which can regulate the *Vata* and *Pitta.* The *sthana* of it is *Hrudaya* which is a *pitta pradana sthana* so for the regulation of Hypertension the best drugs would be *pittahara dravya* which does not cause much vitiation to the *Vata* and *kapha* Even though *amla rasa* is considered as *Hrudya* it increases the pitta and burning sensation it also promotes vitiation of the pitta increasing the flow of the blood to various organs Hence other rasas which can Help to reduce pitta like *Kasaya rasa* are more preferable in this condition Hence for the present study two *kasaya rasa pradana dravyas* are selected *Kaṣaya rasa* being *prthvi* and *akasa mahabhuta pradhana* reduces the *snigdha* and *ushnatva* of the *pitta* and r*akta Dosha* thus makes the r*aktha* attain lightness and move properly in the *srotas*. The *Laghu* and *Ruksha guna* will be compensated by the *Pruthvi mahabhuta* reducing the *Vata* obstruction and the obstruction to the flow of the blood. The slight *Ushna Virya* of both the drugs will reduce the obstruction to the flow of *Vata* by removing the *kapha* or by the *lekhana* property.

## Conclusion

The pharmacological effects of *Parevata* and *Arjuna* have been observed to alleviate Hypertension. These herbs possess *Kasaya* rasa and *ushna virya* properties, which are believed to potentially influence the *vata* and *pitta doshas*. This study highlights that both *Parevata* and *Arjuna* contribute to their equal effectiveness in alleviating the Hypertension. Thus from the above inferences it can be said that both *Parevata* and Arjuna are useful in managing the Hypertension effectively. From the comparative study it is observed that *Parevata* is slightly more effective than *Arjuna*. But the control is much longer in *Arjuna* than *Parevata*. Even though the results obtained are encouraging, there is a need to identify the same in the large number of populations. So, the study may further be taken up in a large population and also in comparison with the present day drugs of choice, to know the better efficacy of the medicines.

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